PATENT SPECIFICATION

630,743

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COMPLETE SPECIFICATION

Improvements in or relating to Valve Mechanisms for Rock Drills.

We, INGERSOLL-RAND COMPANY, a Corporation organized under the laws of the State of New Jersey, United States of America, of 942 Murray Street, Phillipsburg, Warren County, New Jersey, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to rock drills, and more particularly to a valve mechanism for effecting the distribution of pressure fluid to the cylinder of the rock drill.

One object of the invention is to obtain a rapid and positive action of the valve.

Another object is to obviate the need of overall precision machining of the valve mechanism parts.

Other objects will be in part obvious and in part pointed out hereinafter.

According to the invention a fluid actuated rock drill, comprising a cylinder, a piston and an exhaust port for the cylinder, a valve chest having a valve chamber, ports and passages for conveying pressure fluid to the valve chamber and from the valve chamber to the cylinder and an oscillatory plate valve for the controlling of pressure fluid through the valve chamber, is characterised in that the ports and passages lie at only one end of the valve chamber.

In the drawings accompanying this specification and in which similar reference characters refer to similar parts,

Fig. 1 is an elevation, partly broken away, of a rock drill equipped with a valve mechanism constructed in accordance with the practice of the invention and showing the distributing valve in one limiting position,

Fig. 2 is a view similar to Fig. 1 showing the distributing valve in another limiting position, and

Figs. 3 and 4 are transverse views taken through Fig. 1 on the lines 3—3 and 4—4, respectively.

Referring more particularly to the drawings, 20 designates the rock drill comprising a cylinder 21 having a piston chamber 22 and a free exhaust port 23 intermediate its ends for the piston chamber. The piston chamber 22 contains a reciprocatory hammer piston 24 of the differential type having a stem 25 that extends slidably through a closure 26 for the front end of the piston chamber 22.

The rearward end of the piston chamber 22 is closed by valve mechanism 27 which is clamped against the cylinder 21 by a handle 28 and lies within a cavity 29 of a skirt 30 carried by the handle and threadedly connected to the cylinder 21. Only a fragmentary portion of the grip member of the handle 28 is shown and in it is a passage 31 for conveying pressure fluid from a suitable supply conduit (not shown) to a chamber 32 in the roof of the cavity 29 and communicating with the latter through passages 33 in the valve chest 34 of the valve mechanism 27.

The valve chest comprises a pair of plates 35 and 36. The plate 36 overlies the rearward end of the piston chamber 22 and supports the plate 35, which is recessed to define a valve chamber 37 that communicates with the rearward end of the piston chamber through inlet passages 38 in the plate 36 and with the forward end of the piston chamber through inlet passages 39 in the plate 36 and the wall of the cylinder 21. The plate 36 serves as a bounding surface for the valve chamber 37 and constitutes a seating surface 40 for a valve 41 that effects the distribution of pressure fluid to the ends of the piston chamber 22.

The valve 41 is of the oscillatory disk type having seating surfaces 42 and 43 which converge at the median portion of the valve to form an apex 44 whereon the valve rocks from one limiting position to another. The valve is restrained against movement axially of the valve chamber 37 by the plate 35 and against rotary movement by pins 45 seated in the plate 36 and extending into apertures

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46 in the apex portion of the valve.

In order to obviate the cost of machining the peripheral surface of the valve 41 and the encircling surface of the valve chamber 37 to the precise dimensions required in known valve structures of the oscillatory plate type and wherein the pressure fluid flows across the edge of the valve, the pressure fluid serving to actuate the piston is, in the present instance, directed only through the front end of the valve chamber. To this end the plate 36 is provided with a pair of supply chambers 47 and 48 which are located, respectively, between the median portion of the plate 36 and the inlet passages 38 and 39.

The chambers 47 and 48 are preferably of arcuate shape and, respectively, communicate with the cavity 29 through supply passages 49 and 50 in the plate 36. The supply passages are of such number and cross-sectional area that the combined areas of each group is somewhat smaller than the flow area of the associated group of inlet passages.

In the example illustrated, each supply chamber communicates with the supply cavity 29 through two supply passages and three inlet passages afford communication between the valve chamber and the piston chamber. It will, however, be readily understood that any number of supply passages and inlet passages may be provided, as for example, one of each and that in such case the flow area of the supply passage will be somewhat smaller than that of the associated inlet passage.

The following is a description of the operation of the device: In the positions of the valve and the piston shown in Fig. 1, pressure fluid will flow from the supply chamber 47 through the right-hand side of the valve chamber and through the inlet passages 38 into the rearward end of the piston chamber and drive the piston forwardly on its working stroke. Pressure fluid will continue to flow through these channels until the piston uncovers the exhaust port 23 whereupon there will be an abrupt drop in pressure beneath the surface 42 of the valve. At the same time the air compressed in the front end of the piston chamber, and acting against the seating surface 43 of the valve, and the pressure fluid within the chamber 48 will tilt the valve to its other limiting position and cut off communication between the supply chamber 47 and the inlet passages 38.

In the new position of the valve, pressure fluid will flow from the supply chamber 48 through the left-hand end of the valve chamber and the inlet passage 39 to the front end of the piston chamber for returning the piston 24 to its initial position. When, during its rearward stroke, the piston uncovers the exhaust port 23 to communicate the front end of the piston chamber with the atmosphere, the pressure beneath the surface 43 of the valve drops sharply, and the compression in the back end of the piston chamber acting against the surface 42, and the pressure fluid in the supply chamber 47 will tilt the valve to cut-off communication between the supply chamber 48 and the inlet passages 39 and to again charge the piston chamber for a new working stroke of the piston.

The passages 49 and 50 for conveying fluid to the valve chamber 37 may differ in size in order to restrict the supply of fluid to one end of the cylinder.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed we declare that what we claim is:—

1. A fluid actuated rock drill, comprising a cylinder, a piston and an exhaust port for the cylinder, a valve chest having a valve chamber, ports and passages for conveying pressure fluid to the valve chamber and from the valve chamber to the cylinder and an oscillatory plate valve for the controlling of pressure fluid through the valve chamber, characterised in that the ports and passages lie at only one end of the valve chamber.

2. A fluid actuated rock drill according to Claim 1, in which each port, for conveying fluid from the valve chamber, is associated with at least one port for conveying fluid to the valve chamber, and the associated ports are closed simultaneously by the plate valve.

3. A fluid actuated rock drill according to Claim 1 or 2 in which the passages for conveying fluid to the valve chamber vary in size with respect to each other, in order to restrict the supply of fluid to one end of the cylinder.

Dated this 23rd day of June, 1947.

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[This Drawing is a reproduction of the Original on a reduced scale.]

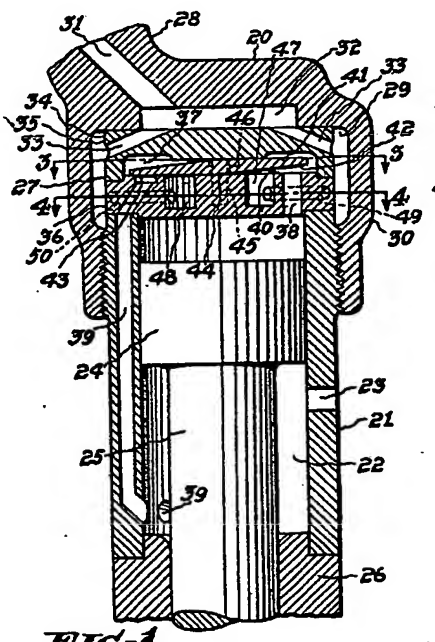

FIG-1.

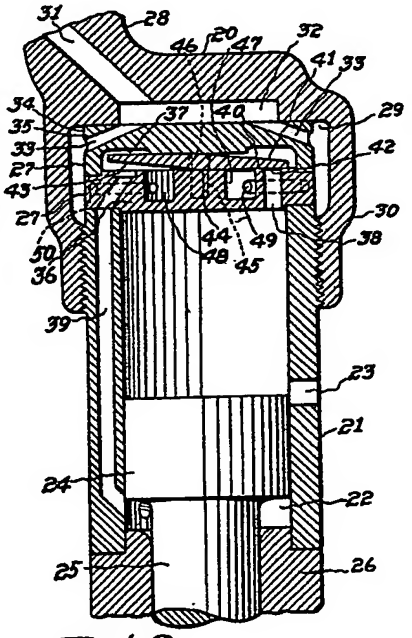

FIG-2.

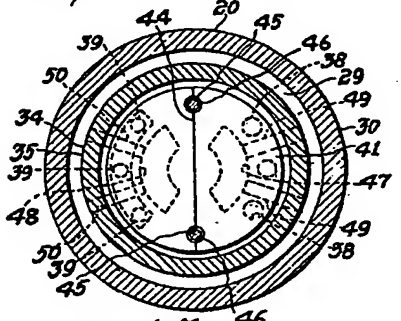

FIG-3.

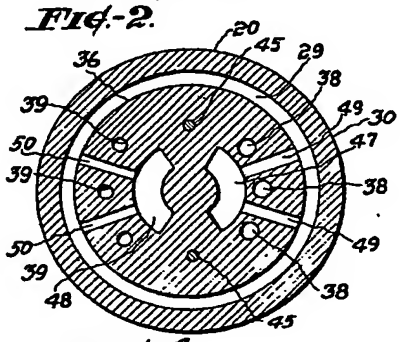

FIG-4.

H.M.S.O. (Ty. P.)